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Booz-Allen and Hamilton, Inc, Bethesda, MD

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16. ABSTRACT

This report presents an analysis of alternative motor vehicle emission inspection and maintenance programs for the following metropolitan areas: Davenport, Iowa; Des Moines, Iowa; Omaha, Nebraska-Council Bluffs, Iowa; Wichita, Kansas; and Johnson and Wyandotte Counties in Kansas (Kansas City area). The study methodology utilized is described. The study included collecting data, determining criteria for selecting alternative program configurations, screening program options, and evaluating alternative configurations selected through the screening process. Program alternatives were evaluated in terms of emissions reductions attainable, geographic coverage, effective motor vehicle population, inspection frequency, consumer protection, quality assurance, costs and financial feasibility. The ease of implementing different alternatives was also studied.

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INSPECTION/MAINTENANCE PROGRAM OPTIONS FOR IOWA, KANSAS AND NEBRASKA

Executive Summary

by

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EXECUTIVE SUMMARY

An inspection/maintenance (I/M) program is a program designed to reduce emissions from in-use vehicles by identifying vehicles that need emissions control related maintenance and requiring that the necessary maintenance be performed. In an inspection/maintenance program, the vehicles in the program area are inspected at regular intervals to check for the proper operation of the exhaust emissions controls. The vehicles that do not meet a pre-determined set of emissions standards set for the inspection are required to undergo the necessary maintenance to meet the standards. These vehicles are reinspected to assure that the required maintenance is performed. This report evaluates alternative inspection/maintenance programs for the States of Iowa, Kansas, and Nebraska.

1. INSPECTION AND MAINTENANCE PROGRAMS FOR VEHICLE EMISSIONS CONTROL MAY HAVE TO BE IMPLEMENTED IN FIVE METROPOLITAN AREAS IN IOWA, KANSAS, AND NEBRASKA TO IMPROVE AIR QUALITY

The control of emissions from new motor vehicles and industrial sources has considerably improved the ambient air quality in many areas over the past several years. In the following five metropolitan areas in Iowa, Kansas, and Nebraska, however, the health-related ambient air quality standards for carbon monoxide and/or ozone as required by the Clean Air Act of 1970 have not yet been attained:

- Johnson and Wyandotte Counties, Kansas, including Kansas City
- Sedgwick County, Kansas, including Wichita
- Polk County, Iowa, including Des Moines
- Pottawattamie County, Iowa, including Council Bluffs
- Scott County, Iowa, including Davenport
- Douglas and Sarpy Counties, Nebraska, including Omaha.

The 1977 Amendments to this Act set December 31, 1982 as the new attainment date for these areas, with a possible extension of up to five years for attaining the ambient standards for two pollutants, ozone and carbon monoxide, provided that certain conditions are met by the States requesting the extension. One of the conditions includes a requirement for the States to implement motor vehicle inspection/maintenance (I/M) programs in specified non-attainment areas of the State.

The States of Iowa, Kansas, and Nebraska are in the process of determining whether an inspection/maintenance program will be needed in the above areas.

2. SINCE DIFFERENT TEST PROCEDURES AND PROGRAM ADMINISTRATIVE OPTIONS EXIST FOR AN I/M PROGRAM, THE STATES OF IOWA, KANSAS, AND NEBRASKA MUST CHOOSE THE PROGRAMS THAT BEST MEET THEIR NEEDS

A State desiring to implement an I/M program has three basic administrative options available to it:

- The State may own (or lease) and operate the inspection facilities
- The State may franchise a contractor who will own and operate the inspection facilities
- The State may certify a large number of privately owned garages or service stations to perform the inspections.

Similarly, a State has a number of options for testing automobile emissions:

- The exhaust from a vehicle can be sampled to determine the concentration of carbon monoxide and hydrocarbons for comparison with appropriate emissions standards. This test can be performed with the vehicle at idle speed or under a simulated load representing actual driving conditions.
- The emissions control devices on the vehicle can be checked for their proper functioning.

3. AFTER AN INITIAL SCREENING OF VARIOUS I/M PROGRAM OPTIONS, FIVE ALTERNATIVE I/M PROGRAMS WERE SELECTED FOR DETAILED EVALUATION FOR EACH STUDY AREA

A preliminary evaluation of different administrative approaches, test procedures, and other components of an I/M program was conducted. The following five administrative approaches and test methods were selected for further evaluation:

- State-owned and -operated facilities conducting idle mode tests
- State-owned and -operated facilities conducting loaded mode tests
- Contractor-owned and -operated facilities conducting idle mode tests
- Contractor-owned and -operated facilities conducting loaded mode tests
- Certified private garages conducting idle mode tests.

Options for several important program components such as inspection frequency and geographic scope were also evaluated. The following options were selected and combined with the above program types for the purpose of comparative analysis:

- Mandatory inspection of all light duty vehicles (LDVs)
- Annual inspection, evenly distributed over the year with a free reinspection at the same station, if necessary
- A stringency factor of 30 percent*
- Inclusion of a training course for inspectors and mechanics to be run by the State

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* Stringency factor represents the percentage of vehicles inspected that require maintenance to meet the emissions standards established for the program.

- Inclusion of a public information campaign to alert the public as to the new inspection requirement

- Implementation of I/M in the non-attainment areas only

- Use of State-owned and -operated challenge garages and a State-run quality audit and enforcement program (garage operated program only).

4. THE ALTERNATIVE I/M PROGRAMS WERE EVALUATED AGAINST A SET OF CRITERIA INCLUDING COST AND INSTITUTIONAL FACTORS

Capital investments, program start-up costs, annual operating costs, and the inspection fee to make the program self-supporting were estimated for each I/M program alternative for each of the three States. Several institutional factors were also evaluated including:

- Financial feasibility
- Ease of implementation
- Consumer protection
- Consumer convenience
- Flexibility for future modification

The cost-effectiveness of each program option was evaluated to determine the non-methane hydrocarbon reduction per dollar expended. Evaluation summaries were prepared for the program alternatives in Iowa, Kansas, and Nebraska.

5. FOR IOWA, THE STATE-OPERATED IDLE TEST PROGRAM WOULD BE PREFERABLE IF EQUAL WEIGHT WERE ASSIGNED TO EACH OF THE EVALUATION CRITERIA

The comparison of I/M program options given in Table 1 shows that no one program is preferred for all criteria. The selection of the preferred program depends upon the relative importance of each of the evaluative criteria. If each of the criteria were given equal weight, then the State-operated approach would be the preferred program for Iowa primarily

TABLE 1
Comparison of I/M Program Options for Iowa

Program Type	Cost Per Vehicle	Average Cost Effectiveness Pounds of Non-Methane Hydrocarbons Reduced Per Dollar Spent		Financial Feasibility	Ease of Implementation	Consumer Convenience	Consumer Protection	Flexibility For Future Modification
STATE								
Idle	$3.50	0.83	($2410)*	Programs will be self-supporting; State capital investment needs are substantial ($2.3 to $3.8 million) but are small compared to State general fund.	**Low:** May face administrative constraints in hiring or curtailing staff and acquiring land, buildings and equipment.	**Low:** Limited number of central testing facilities requires travel for test and retest. Repair must be done elsewhere.	**High:** Quality of testing and repairs can be effectively controlled and monitored.	**High:** State has direct control over the entire program.
Loaded	5.25	0.67	(1945)					
CONTRACTOR								
Idle	3.75	0.78	(2265)	Programs will be self-supporting; no State capital investment needed.	**High:** Contractor can hire or curtail staff and acquire land, buildings, and equipment without administrative constraints; relieves State of operating responsibilities.	**Low:** Limited number of central testing facilities requires travel for test and retest. Repair must be done elsewhere.	**High:** Quality of testing and repairs can be effectively controlled and monitored.	**Medium:** Changes in program must be negotiated with the contractor.
Loaded	5.50	0.67	(1945)					
PRIVATE GARAGE								
Idle	6.50	0.60	(1742)	Program will be self-supporting; minor State capital investment needed.	**Medium:** Infrastructure of existing change of ownership safety inspection program would ease implementation, but State must still manage program.	**High:** Large number of garages distributed throughout the study areas for easy access. Provides opportunity for one stop test, repair, and retest.	**Low to Medium:** Depending upon the effectiveness of quality control measures for testing and repairs.	**Low:** State must deal with a large number of private garages to make changes effective.

*Numbers in parentheses represent dollars per ton of non-methane hydrocarbons reduced.

due to its low cost and flexibility for future modification. However, each decision-maker must weigh the relative importance of the criteria for selecting the preferred program.

6. FOR KANSAS, THE STATE- OR CONTRACTOR-OPERATED IDLE TEST PROGRAMS WOULD BE PREFERABLE IF EQUAL WEIGHT WERE ASSIGNED TO EACH OF THE EVALUATION CRITERIA

The comparison of I/M program options given in Table 2 shows that no one program is preferred for all criteria. The selection of the preferred program depends upon the relative importance of each of the evaluation criteria. If each of the criteria were given equal weight, then either the State- or contractor-operated idle test options would be the preferred program in Kansas primarily due to their low cost and flexibility for future modification. However, each decision-maker must weigh the relative importance of the criteria for selecting the preferred program.

7. FOR NEBRASKA, THE PRIVATE GARAGE-OPERATED IDLE TEST PROGRAM WOULD BE PREFERABLE IF EQUAL WEIGHT WERE ASSIGNED TO EACH OF THE EVALUATION CRITERIA

The comparison of I/M program options given in Table 3 shows that no one of the alternative I/M programs is preferred for all criteria. The selection of the preferred program depends upon the relative importance of each of the evaluative criteria. If the criteria were given equal weight, then the private garage-operated program would be the preferred program in Nebraska primarily due to its ease of implementation and consumer convenience. However, each decision-maker must weigh the relative importance of the criteria for selecting the preferred program.

TABLE 2
Comparison of I/M Program Options for Kansas

Program Type	Cost Per Vehicle	Average Cost Effectiveness: Pounds of Non-Methane Hydrocarbons Reduced Per Dollar Spent		Financial Feasibility	Ease Of Implementation	Consumer Convenience	Consumer Protection	Flexibility For Future Modification
STATE								
Idle	$3.25	0.70	($2033)*	Programs will be self-supporting; State capital investment needs are substantial ($3.0 to 5.4 million) but are small compared to State general fund.	**Low:** May face administrative constraints in hiring or curtailing staff and acquiring land, buildings and equipment.	**Low:** Limited number of central testing facilities requires travel for test and retest. Repair must be done elsewhere.	**High:** Quality of testing and repairs can be effectively controlled and monitored.	**High:** State has direct control over the entire program.
Loaded	5.00	0.58	(1684)					
CONTRACTOR								
Idle	3.75	0.66	(1916)	Programs will be self-supporting; no State capital investment needed.	**High:** Contractor can hire or curtail staff and acquire land, buildings, and equipment without administrative constraints. Relieves State of operating responsibility	**Low:** Limited number of central testing facilities requires travel for test and retest. Repair must be done elsewhere.	**High:** Quality of testing and repairs can be effectively controlled and monitored.	**Medium:** Changes in program must be negotiated with the contractor.
Loaded	5.00	0.58	(1684)					
PRIVATE GARAGE								
Idle	6.75	0.49	(1423)	Program will be self-supporting; minor State capital investment needed.	**Medium:** Infrastructure of existing change of ownership safety inspection program would ease implementation, but State must still manage program.	**High:** Large number of garages distributed throughout the study areas for easy access. Provides opportunity for one stop test, repair, and retest.	**Low to Medium:** Depending upon the effectiveness of quality control measures for testing and repairs.	**Low:** State must deal with a large number of private garages to make changes effective.

*Numbers in parentheses represent dollars per ton of non-methane hydrocarbons reduced.

TABLE 3
Comparison of I/M Program Options for Nebraska

Program Type	Cost Per Vehicle	Average Cost Effectiveness: Pounds of Non-Methane Hydrocarbons Reduced Per Dollar Spent	Financial Feasibility	Ease Of Implementation	Consumer Convenience	Consumer Protection	Flexibility For Future Modification
STATE							
Idle	$3.00	0.66 ($1916)*	Programs will be self-supporting; State capital investment needs are substantial ($1.6 to $2.7 million) but are small compared to State general fund.	**Low:** May face administrative delays in hiring or curtailing staff and acquiring land, buildings and equipment.	**Low:** Limited number of central testing facilities requires travel for test and retest. Repair must be done elsewhere.	**High:** Quality of testing and repairs can be effectively controlled and monitored.	**High:** State has direct control over the entire program.
Loaded	4.50	0.55 (1597)					
CONTRACTOR							
Idle	3.50	0.62 (1800)	Programs will be self-supporting; no State capital investment needed.	**Medium:** Contractor can hire or curtail staff and acquire land, buildings, and equipment without administrative delays.	**Low:** Limited number of central testing facilities requires travel for test and retest. Repair must be done elsewhere.	**High:** Quality of testing and repairs can be effectively controlled and monitored.	**Medium:** Changes in program must be negotiated with the contractor.
Loaded	4.75	0.55 (1597)					
PRIVATE GARAGE							
Idle	4.25	0.58 (1684)	Program will be self-supporting; minor State capital investment needed.	**High:** Annual emissions inspection can be easily added to the existing annual safety inspection program.	**High:** Large number of garages distributed throughout the study areas for easy access. Provides opportunity for one stop test, repair, and retest.	**Low to Medium:** Depending upon the effectiveness of quality control measures for testing and repairs.	**Low:** State must deal with a large number of private garages to make changes effective.

*Numbers in parentheses represent dollars per ton of non-methane hydrocarbons reduced.